Hot Cells

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The Hot Fuel Examination Facility (HFEF) is one of the largest hot cells dedicated to radioactive materials research at Idaho National Laboratory (INL). The nation's lead laboratory for nuclear energy research and development utilizes HFEF capabilities in researching radioactive materials development and characterization.

HFEF began operations in 1975, providing a two hot-cell complex and radiation-shielded rooms for handling irradiated reactor fuel and structural materials. HFEF hosted examinations providing data used to determine the performance of fuels and materials irradiated in EBR-II and other facilities. The facility performs transuranic (TRU) waste characterizations supporting the Waste Isolation Pilot Plant (WIPP) in New Mexico. Underneath the hot cells, HFEF's basement hosts the Neutron Radiography Reactor (NRAD), a reactor built for neutron radiography irradiation of small test components.

Capabilities

The facility provides shielding and containment for remote examination, processing and handling of highly radioactive TRU-bearing materials. Shielded cells, unshielded labs, support areas and special equipment for handling, examining and testing highly radioactive materials make HFEF an invaluable part of INL's nuclear infrastructure.

Modifications to the facility now allow for receipt of almost any over-the-road commercial shipping cask and partnering with the commercial industry to test used commercial Light Water Reactor nuclear fuel rods.

HFEF provides support to a variety of programs including, but not limited to, the nuclear fuel cycle research, Generation IV technologies and Space Nuclear programs. It includes non-destructive

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examination, such as dimensional measurements and neutron radiography, and destructive examination, such as mechanical testing or metallographic/ceramographic characterization.

Development at HFEF also supports pyroprocessing activities at the Fuel Conditioning Facility. Pyroprocessing, or pyrometallurgical treatment of spent nuclear fuel, is the principal alternative to aqueous reprocessing technology that is being developed under the nuclear fuel cycle research.

Significant projects performed in HFEF include:

1) Examination of fuels and components for the Liquid Metal Fast Breeder Reactor (LMFBR) and Integral Fast Reactor (IFR) programs.
2) Preparation and post-test examination tests utilizing large test loops for irradiation in the Transient Reactor Test Facility (TREAT) and the Sodium Loop Safety Facility (SLSF).
3) Examination of test assemblies and fuel rods irradiated in the Fast Flux Test Facility (FFTF). HFEF is the only large, inert atmosphere hot cell that is suitable for examination of chemically reactive materials.

Experimental Breeder Reactor-II/Transuranic Waste Characterization

Experimental Breeder Reactor-II (EBR-II) was one of the first liquid-metal-cooled fast breeder reactors to prove it could serve as an electric-power-generating plant operating on recycled fuel. Breeder reactors produce more fuel than they consume. EBR-II began generating power in August 1964 and was decommissioned in 1994.

HFEF still performs examinations on the fuels and materials irradiated in EBR-II, providing data to determine their quality of performance. The facility also performs TRU waste characterizations supporting WIPP in New Mexico.

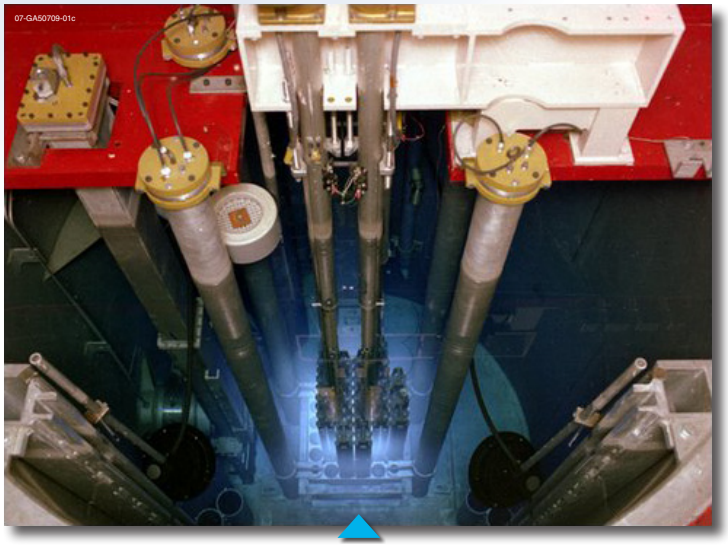
Hot Cells

The facility has two large, highly-shielded hot cells. The main cell, which is stainless steel-lined and gas tight, has 15 workstations, each with a 4-foot thick window of oil-filled, cerium-stabilized glass and a pair of remote manipulators. The decontamination cell has six similarly equipped workstations. Each cell is equipped with overhead cranes and overhead electromechanical manipulators. Cell exhaust passes through at least two stages of HEPA filtration.

Radioactive materials are introduced into the hot cells via a shielded cask on a transfer cart, which accesses the cells through an under-cell transfer tunnel. A penetration through the top of the main cell also allows the introduction of large components or fuel assemblies.

Neutron Radiography Reactor

NRAD is a 250 kW TRIGA reactor in the basement of HFEF. It is equipped with two beam tubes and two separate radiography stations that make it one of the finest facilities in the world for neutron radiography irradiation of small test components, a process not possible using conventional X-ray methods.



The NRAD reactor is a small TRIGA reactor that uses neutron radiography to examine the integrity of test materials without physically damaging them. It also serves as a neutron source for isotope production.

For more information

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